

REMARKS***Summary of the Response***

By the present response, claims 12, 22 and 28 have been amended for the Examiner's consideration. Additionally, claims 20 and 26 have been canceled without prejudice or disclaimer. Applicant submits that no new matter is added by the present amendment. Support for the amendment may be found, for example, at least in Figures 1A – 2D. Accordingly, upon entry of the amendment, claims 12 - 19, 21 - 25 and 27 - 36 will be pending. Reconsideration of the rejected claims in view of the above amendment and following remarks is respectfully requested.

Summary of the Office Action

In the instant Office Action, the Examiner has rejected claims 12 – 36 over the art of record. By the present amendment and remarks, Applicant submits that the rejections have been overcome, and respectfully requests reconsideration of the outstanding Office Action and allowance of the present application.

Amendment Proper for Entry

Applicant submits that the entry of the above amendment is proper. Applicant submits that the entry of the amendment is proper, since such amendment places the application in condition for allowance or, alternatively, places the application in better form for appeal.

Interview Summary

Applicant appreciates the Interview between Examiner Andrew Nguyen and Applicant's representative Jon Miller conducted on December 13, 2011. During the Interview, Applicant's representative discussed proposed claim amendments, and inquired whether the Examiner would consider entering the amendments. The Examiner indicated that the amendment would not be entered without the filing of a Request for Continued Examination. Accordingly, Applicant is filing a Request for Continued Examination along with amendments to the claims as discussed during the Interview.

Traversal of Drawing Objections

Applicant traverses the objection to the drawings for purportedly failing to show all the features specified in the claims. Specifically, the Examiner asserts that the "swirler space comprising a *tapering area*," as recited in claim 14, is not shown in the drawings. The Examiner asserts that a tapering area requires a decrease in area, and as the "inner element follows the same angle" as the outer element, the area of the passage does not change.

Applicant disagrees. Applicant submits the Figures clearly show a tapering area *with a decrease in cross-sectional area*, for example, at least in Figures 1A and 1B. More specifically, Applicant submits the tapering area is shown, for example, between the portion of the swirler space where the outer wall begins to angle inwardly and where the outer wall ends its inwardly-directed angle. While acknowledging that the inner element may follow the same angle as the outer element, Applicant notes that the starting and ending points of these similarly angled walls is different, thus providing the tapering area.

Accordingly, Applicant requests the Examiner withdraw the objection to the drawings for purportedly failing to show all the features specified in the claims.

Additionally, Applicant traverses the objection to the drawings for including solid black shading and lines, numbers and letters of inconsistent line thickness and/or quality. Initially, Applicant respectfully submits that none of the Figures include solid black shading. That is, while there is some shading in the Figures, Applicant submits that there is no *solid black shading*. Additionally, Applicants respectfully submit that Figures 1A and 1B do not include lines, numbers and letters of inconsistent line thickness and/or quality. Additionally, with the previous response Applicant presented three (3) sheets of amended Figures with lines, numbers and letters of consistent line thickness and quality corresponding to Figures 2 - 6.

Thus, Applicant respectfully submits that the none of the remaining figures include *solid black shading*. Moreover, Applicant submits that Figures 2 - 6 have been amended so that lines, numbers and letters are of consistent line thickness and quality.

Accordingly, Applicant respectfully requests the Examiner withdraw the objection to the drawings for purportedly including solid black shading and lines, numbers and letters of inconsistent line thickness and/or quality.

Claim Objection Rendered Moot

Claims 20 and 26 were objected to for failing to further limit the subject matter of a previous claim. By the present amendment, claims 20 and 26 have been canceled without prejudice or disclaimer. As such, Applicants respectfully submit that the claim objection has been rendered moot.

Accordingly, for at least this reason, Applicants request the objection to the claims be withdrawn.

Traversal of Rejection Under 35 U.S.C. § 102(b)

To anticipate a claim, each and every element as set forth in the claim must be found, either expressly or inherently described, in a single prior art reference. MPEP § 2131. Applicant submits that none of the applied documents discloses each of the features recited in at least the independent claims.

1. Over GRADON

Applicant traverses the rejection of claims 28 - 30 and 32 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,498,059 to Gradon et al. (hereinafter “GRADON”). The rejection is respectfully traversed.

In addressing previously presented claim 28, the Examiner asserted GRADON (or, alternatively, U.S. Patent No. 3,866,413 to Sturgess (hereinafter “STURGESS ‘413”) discloses each of the features of previously presented claim 28. While Applicant does not agree with the Examiner that the applied art under 35 U.S.C. §102(b) anticipates the embodiments of the invention recited in at least claim 28, in an effort to advance prosecution, claim 28 has been amended to even more clearly define the features of the present invention. Further, Applicant expressly reserves the right to refile the subject of independent claim 28 as presented prior to this amendment in one or more continuing applications.

Independent Claim 28

Independent claim 28 recites:

A method of injecting fuel from an injection element into a combustion chamber comprising:
 guiding fuel into the combustion chamber through a first outlet opening of the injection element;
 guiding fuel into the combustion chamber through a second outlet opening of the injection element arranged coaxially with the first outlet opening; and
 forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening, and structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element.

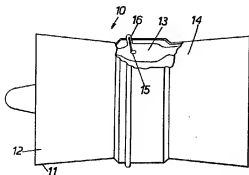
Applicant submits that GRADON does not disclose each of the features of the present invention. For example, Applicant submits that GRADON does not disclose “forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening, and structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element,” as recited in claim 28.

No Disclosure of Forming Downstream of The Injection Element in Fuel-Flow Direction a Cooling Liquid Film Layer in the Combustion Chamber Through Bores Structured and Arranged To Supply the Cooling Liquid Film Layer in an Outwardly-Directed Direction Relative to a Longitudinal Axis Of The First Outlet Opening Upon Exiting The Injection Element

Applicant submits GRADON does not disclose forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening, and structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element.

Initially, in addressing previously-presented claim 28, the Examiner asserts that the surface 55 is reasonably construed as a surface of a combustion chamber. Applicant respectfully disagrees, and submits that surface 55 is a surface of the burner. Applicant notes GRADON explicitly designates element 13, as shown in Figure 1 (reproduced below) as the combustion chamber of GRADON. Figure 1 also illustrates the burner 15 and its relative arrangement to the combustion chamber 13 of GRADON.

FIG.1

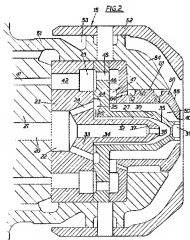


While acknowledging that the burner 15 is situated within the combustion chamber 13, Applicant respectfully submits that one of ordinary skill in the art would not consider surface 55 to be part of the combustion chamber 13.

In view of the above, Applicant respectfully submits the Examiner is not free to designate surface 55, which is an element of the burner 15, as a wall of the combustion chamber 13. That is, such a designation is completely in conflict with the explicit teachings of GRADON, which designates element 13 as the combustion chamber.

Additionally, assuming *arguendo* that the Examiner can reasonably consider surface 55 to be part of the combustion chamber (which Applicant does not concede), Applicant submits GRADON does not disclose forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening, and structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element.

GRADON discloses a burner, for example, for a gas turbine engine combustion chamber. Applicant has reproduced Figure 2 of GRADON below, which illustrates the burner 15.



In addressing previously presented claim 28, the Examiner designates drillings 64 as the recited bores. Applicant submits, however, that the Examiner-designated bores (i.e., drillings 64) are not structured and arranged so as to form *downstream of the injection element* in a fuel-flow direction a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening, and structured and arranged to supply the cooling liquid *film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element*.

Applicant respectfully submits GRADON does not disclose that the Examiner-designated bores (i.e., drillings 64) open to the combustion space. Rather, the drillings 64 are structured and arranged to supply fuel to reservoir 62, and thus open to the reservoir 62. From the reservoir 62, fuel is supplied to surface 55. However, drilling 64, reservoir 62, and surface 55 are all located *within* the injection element (or burner 15). As such, the Examiner-designated bores are not arranged so as to form *downstream of the injection element* in a fuel-flow direction a cooling liquid film layer in the combustion chamber.

Moreover, as shown in the above Figure, the Examiner-designated bores (i.e., drillings 64) are structured to supply fuel to surface 55, such that a film layer is supplied in an inwardly-directed direction relative to the longitudinal axis of the first outlet opening upon exiting the injection element. That is, surface 55, which is inwardly-directed relative to the longitudinal axis of the first outlet, and the air flow flowing through the air supply duct 53 will cause the film layer thereon to be supplied in an *inwardly-directed direction* relative to a longitudinal axis of the first outlet opening *upon exiting the injection element*.

Accordingly, for at least these reasons, Applicant respectfully submits that GRADON does not disclose each of the features of claim 28, and does not anticipate the present invention.

Dependent Claims 29, 30 and 32

Applicant respectfully submits that claims 29, 30 and 32 depend from allowable independent claim 28, and are allowable at least based upon the allowability of the independent claims, and further because these claims recite additional subject matter to further define the instant invention.

Accordingly, for at least these reasons, Applicant respectfully requests the Examiner withdraw the rejection of claims 28 - 30 and 32 and indicate claims 28 - 30 and 32 are allowable.

2. Over STURGESS '413

Applicant traverses the rejection of claims 28, 29 and 31 under 35 U.S.C. § 102(b) as being anticipated by STURGESS '413. The rejection is respectfully traversed.

All Claim Features of Previously-Presented Claim Not Addressed

Previously-presented claim 28 recites, in pertinent part:

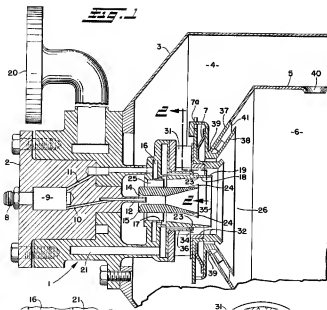
... forming a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening.

In addressing this feature of previously-presented claim 28, the Examiner states “[t]he bores [17] inject fuel onto a prefilming surface 18 (i.e. they create a film layer).” However, Applicant submits the Examiner again has failed to address each of the features of claim 28. That is, the Examiner never addressed forming a cooling liquid film layer in the combustion chamber. As such, Applicant submits the Examiner has issued an incomplete office action and an unclear record.

No Disclosure of Forming a Cooling Liquid Film Layer in Combustion Chamber

Applicant submits STURGESS '413 does not disclose forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening, and structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element.

In addressing previously-presented claim 28, the Examiner designates the prefiling surface 18 as the recited combustion chamber. However, Applicant notes STURGESS '413 specifically designates element 6 as the combustion chamber of the STURGESS '413 device. Applicant has reproduced Figure 1 of STURGESS '413, which illustrates the Examiner-designated combustion chamber (i.e., prefiling surface 18) and actual combustion chamber 6.



As shown in Figure 1, the Examiner-designated combustion chamber (i.e., prefiling surface 18) is located upstream of the actual combustion chamber 6. Moreover, Applicant submits the Examiner is not free to designate prefiling surface 18 as a combustion chamber

when STURGESS '413 explicitly designates another element as the combustion chamber. As such, Applicant submits the prefiling surface 18 cannot reasonably constitute the recited combustion chamber.

Furthermore, assuming *arguendo* that the Examiner may reasonably designate prefiling surface 18 as a combustion chamber (which Applicant does not concede) Applicant submits STURGESS '413 does not disclose forming *downstream of the injection element in a fuel-flow direction* a cooling liquid film layer in the combustion chamber through bores arranged to coaxially surround the first outlet opening. That is, Applicant submits that prefiling surface 18 is not *downstream of the injection element in a fuel-flow direction*. Rather, Applicant respectfully submits that prefiling surface 18 is *within* the injection element.

Thus, for at least these reasons, Applicant submits STURGESS '413 does not disclose the features of claim 28, and does not anticipate the present invention.

Dependent Claims 29 and 31

Applicant respectfully submits that claims 29 and 31 depend from allowable independent claim 28, and are allowable at least based upon the allowability of the independent claims, and further because these claims recite additional subject matter to further define the instant invention.

Claim 29

In addressing claim 29, the Examiner states “[t]he surface 18 is considered a combustion space inner wall.” For the reasons discussed above with regard to claim 28, Applicant respectfully submits that the Examiner’s assertion that the surface 18 is considered a combustion

space inner wall is unsupportable. That is, Applicant submits STURGESS '413 specifically designates element 6 as the combustion chamber of the STURGESS '413 device. Thus, Applicant submits the Examiner is not free to designate prefilming surface 18 as a combustion chamber surface when STURGESS '413 explicitly designates another element as the combustion chamber.

Thus, for at least these reasons, Applicant submits STURGESS '413 does not disclose the features of claim 29, and does not anticipate the present invention.

Accordingly, for at least these reasons, Applicant respectfully requests the Examiner withdraw the rejection of claims 28, 29 and 31 and indicate claims 28, 29 and 31 are allowable.

Traversal of Rejection Under 35 U.S.C. § 103(a)

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness. See MPEP §2142. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.¹ Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in

¹ While the *KSR* court rejected a rigid application of the teaching, suggestion, or motivation ("TSM") test in an obviousness inquiry, the [Supreme] Court acknowledged the importance of identifying "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does" in an obviousness determination. *Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd.*, 492 F.3d 1350, 1356-1357 (Fed. Cir. 2007) (quoting *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1731 (2007)).

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the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Applicant submits that the combination of references do not teach or suggest each of the features of the present invention. Moreover, Applicant submits that the Office failed to present a prima facie case of obviousness, and that the Examiner has failed to demonstrate a likelihood of success for the Examiner-proposed modification.

1. Over PAUL in view of GRADON and DEFREITAS

Applicant traverses the rejection of claims 12 - 16, 19 - 22, 25 - 27 and 33 - 36 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,916,896 to Paul (hereinafter "PAUL") in view of GRADON and U.S. Patent No. 5,673,554 to DeFreitas (hereinafter "DEFREITAS").

In addressing previously presented claims 12 and 22, the Examiner asserted PAUL in view of GRADON and DEFREITAS teaches or suggests each of the features of these previously presented claims. While Applicant does not agree with the Examiner that the applied art under 35 U.S.C. §103(a) renders unpatentable the embodiments of the invention recited in at least claims 12 and 22, in an effort to advance prosecution, claims 12 and 22 have been amended to even more clearly define the features of the present invention. Further, Applicant expressly reserves the right to refile the subject of independent claim 12 and 22 as presented prior to this amendment in one or more continuing applications.

Independent Claims 12 and 22

Embodiments of the present invention are directed to an injection element. Claims 12 and 22 recite, in pertinent part:

. . . bores structured and arranged for forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer, wherein . . . the bores are structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element, . . .

In addressing previously-presented claims 12 and 22, the Examiner asserts that PAUL teaches an injection element that is a rocket drive, but fails to teach the recited structural features of the claimed rocket drive. The Examiner asserts that GRADON teaches the recited features of claims 12 and 22, and that it would have been obvious to one of ordinary skill in the art to combine PAUL and GRADON (with evidence provided by DEFREITAS) to arrive at the instantly claimed invention. Applicant respectfully disagrees with the Examiner's assertions.

Prima Facie Case of Obviousness Not Presented

Applicant submits that the Examiner has failed to present a proper *prima facie* case of obviousness. More specifically, while the Examiner asserts that it would have been obvious to one of ordinary skill in the art to replace the fuel injectors of PAUL with the structure of GRADON, the Examiner fails to articulate a reason why one ordinarily skilled in the art would be motivated to make such a modification of PAUL. As such, Applicant respectfully submits that the rejection is *per se* improper, and the Examiner has failed present a *prima facie* obviousness rejection.

No Likelihood of Success for Examiner-Proposed Modification

Additionally, Applicants submit that there would not be a likelihood of success for the Examiner-proposed modification of PAUL. PAUL teaches a multimode propulsion system

having a plurality of injectors. In different modes of operation, only some of the injectors (i.e., injectors 12) are utilized to inject fuel. As shown in Figure 1 of PAUL, the injectors 12 are arranged to inject fuel in a direction perpendicular to the longitudinal axis of the engine. The burner structure of GRADON, in contrast, is structured and arranged in a direction parallel to the longitudinal axis of the engine to receive a parallelly-directed air flow, and inject fuel in a direction parallel to the longitudinal axis of the engine. The burner structure of GRADON includes air supply ducts that are structured and arranged to receive the parallelly-directed flow of incoming air and supply the air to the burner structure.

With the above in mind, Applicant submits that the Examiner has failed to demonstrate a likelihood of success for replacing the injectors 12 of PAUL with the burner structure of GRADON. That is, as the burner of GRADON requires an orientation parallel to the longitudinal axis of the combustion chamber such that the air supply ducts are arranged to receive the parallel flow of air, placing these burners in the structure of PAUL (i.e. to replace injectors 12) in an orientation perpendicular to the longitudinal axis of the combustion chamber would not allow for the proper supply of incoming air necessary for proper operation of the GRADON burner. Thus, Applicant submits the Examiner has failed to demonstrate a likelihood of success for the Examiner-proposed modification of PAUL.

No Teaching or Suggestion Bores Structured and Arranged for Forming Downstream Of The Injection Element In A Fuel-Flow Direction a Cooling Liquid Film Layer, Wherein . . . the Bores Are Structured and Arranged to Supply the Cooling Liquid Film Layer in an Outwardly-Directed Direction Relative to a Longitudinal Axis of the First Outlet Opening Upon Exiting the Injection Element

Applicant submits that PAUL in view of GRADON and DEFREITAS does not disclose bores structured and arranged for forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer, wherein . . . the bores are structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element. Applicant notes that in addressing previously-presented claims 12 and 22, the Examiner relies on GORDON for purportedly teaching the recited structure. That is, the Examiner acknowledges that PAUL fails to teach or suggest the recited structure, and tacitly acknowledges that DEFREITAS fails to teach or suggest the recited structure, and only relying on DEFREITAS for a purported teaching that combustion technology may be shared between different engine types.

For the reasons articulated above with regard to claim 28, however, Applicant respectfully submits that GORDON fails to teach or suggest bores structured and arranged for forming downstream of the injection element in a fuel-flow direction a cooling liquid film layer, wherein . . . the bores are structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element.

Therefore, Applicant respectfully submits that no reasonable combination of PAUL in view of GRADON and DEFREITAS teaches or suggests that the bores structured and arranged for forming downstream of the injection element in a fuel-flow direction a cooling liquid film

layer, wherein . . . the bores are structured and arranged to supply the cooling liquid film layer in an outwardly-directed direction relative to a longitudinal axis of the first outlet opening upon exiting the injection element, as recited in claims 12 and 22.

Dependent Claims 13 – 16, 19 - 21, 25 - 27 and 33 - 36

By the present amendment, claims 20 and 26 have been canceled without prejudice or disclaimer. As such, Applicant submits the rejection of these claims has been rendered moot.

Additionally, Applicant respectfully submits that claims 13 – 16, 19, 21, 25, 27 and 33 - 36 depend from respective allowable independent claims, and are at least allowable based upon the allowability of the independent claims, and further because these claims recite additional subject matter to further define the instant invention.

Accordingly, for at least these reasons, Applicant respectfully requests the Examiner withdraw the rejection of claims 12 - 16, 19 - 22, 25 - 27 and 33 - 36 and indicate claims 12 - 16, 19, 21, 22, 25, 27 and 33 - 36 are allowable.

2. Over PAUL in view of GRADON and DEFREITAS, and further in view of STURGESS '259

Applicant traverses the rejection of claims 17, 18, 23 and 24 under 35 U.S.C. § 103(a) as being unpatentable over PAUL in view of GRADON and DEFREITAS, and in further view of U.S. Patent No. 3,703,259 to Sturgess (hereinafter STURGESS '259).

Applicant submits claims 17, 18, 23 and 24 depend from respective allowable independent claims, and are allowable based upon the allowability of the independent claims, and because these claims recite additional subject matter to further define the instant invention.

Moreover, Applicants submit STURGESS '259 fails to compensate for the above-noted deficiencies of PAUL in view of GRADON and DEFREITAS. For example, Applicant submits that STURGESS '259 fails to compensate for the Office's failure to present a proper *prima facie* case of obviousness, and fails to compensate for the lack of a likelihood of success for the Examiner-proposed modification of PAUL in view of GRADON and DEFREITAS.

Accordingly, for at least these reasons, Applicant respectfully requests the Examiner withdraw the rejection of claims 17, 18, 23 and 24 and indicate claims 17, 18, 23 and 24 are allowable.

Authorization to Charge Deposit Account

The undersigned authorizes the charging of any necessary fees, including any extensions of time fees required to place the application in condition for allowance by Examiner's Amendment, to Deposit Account No. 19 - 0089 in order to maintain pendency of this application.

CONCLUSION

In view of the foregoing, it is submitted that none of the references of record, either taken alone or in any proper combination thereof, anticipate or render obvious the Applicant's invention, as recited in claims 12 - 19, 21 - 25 and 27 - 36. The applied references of record have been discussed and distinguished, while significant claimed features of the present invention have been pointed out.

Accordingly, reconsideration of the outstanding Office Action and allowance of the present application and all of the claims therein are respectfully requested and now believed to be appropriate.

Should there be any questions, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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